PRINTING SYSTEM AND METHOD OF CONTROLLING A PRINTING SYSTEM

This application is based on application No. 2000-76266 filed in Japan, the contents of which is hereby incorporatesd by reference.

BACKGROUND OF THE INVENTION

The present invention relates to a printing system comprising a printer and a data processing apparatus such as a print server for transmitting job data to the printer.

In a printing system comprising a printer and a print server (for example, a personal computer) for transmitting job data such as image data or text data to the printer, a printer driver for controlling the printer is installed on the print server such that the print server can recognize a printer to which the job data is to be output. In this printing system, various kinds of conditions such as a print output time and the number of sheets to be printed are normally set on the printer driver in the print server, and then, the set information is transmitted to the printer, thereby controlling the printer. Moreover, the print server can acquire information on a printer body, for example, information on operating states (such as sheet feeding, printing and sheet discharging) and error information (such as a sheet feeding error), or information on an optional device to be connected to the printer body such as

a double-sided printing unit or a finisher, for example, information on the connected state or error state of the optional device. In relation to this, in a system disclosed in, for example, Japanese Patent Application Laid-open No. 10-222445, specified information on a printer can be transmitted to a print server via bidirectional communications, wherein a change in the specified information already set can be noticed to the print server.

However, in the conventional system, the acquired information on the printer and its optional device could not be reflected in the printer driver installed on the print server. Therefore, for example, even if consumable items such as sheets, toner or staples were used up in the printer, an operator could still execute setting on consumable items on the printer driver. As a result, the printer and its optional device could not cope with the received job data, and a finish was changed or the job data was discarded.

An object of the present invention is to provide an improved printing system and method of controlling the printing system capable of solving the above-mentioned problems of the conventional system.

Another object of the present invention is to provide a printing system and method of controlling the printing system in which information on a printer body and its optional device, received from a printer is reflected in a printer driver

installed on a print server, thereby enhancing efficiency of a printing operation.

SUMMARY OF THE INVENTION

In an aspect of the invention, there is provided a printing system having a data processing apparatus on which printer driver software capable of setting various kinds of print conditions is installed, and a printer for performing a printing operation based on print job data transmitted from the data processing apparatus, wherein the data processing apparatus comprises: acquiring means for acquiring information on the state of the printer; and information reflecting means for prohibiting or permitting setting of the print conditions relative to the information on the printer driver software based on the information acquired by the acquiring means.

In another aspect of the invention, there is provided a method of controlling a printing system having a data processing apparatus on which printer driver software capable of setting various kinds of print conditions is installed, and a printer for performing a printing operation based on print job data transmitted from the data processing apparatus, wherein the method comprises the steps of: acquiring information on the state of the printer; and prohibiting or permitting setting of the print conditions relative to the information on the printer driver software based on the

information acquired by the acquiring means.

In a further aspect of the invention, there is provided a computer programmed product for controlling a printing system having a data processing apparatus on which printer driver software capable of setting various kinds of print conditions is installed, and a printer for performing a printing operation based on print job data transmitted from the data processing apparatus, wherein the computer programmed product allows the data processing apparatus to execute the processes of acquiring information on the state of the printer and of prohibiting or permitting setting of the print conditions relative to the information on the printer driver software based on the information acquired by the acquiring means.

In a yet further aspect of the invention, there is provided a data processing apparatus to be connected with a printer, comprising: printer driver software capable of setting various kinds of print conditions; acquiring means for acquiring information on the state of the printer; and information reflecting means for prohibiting or permitting setting of the print conditions relative to the information on the printer driver software based on the information acquired by the acquiring means.

In each of the aspects of the invention, the information on the state of the printer may be information on the remaining amount of consumable item loaded in the printer or an optional

device connected to the printer. Furthermore, the consumable item may be at least any one of recording mediums, printing materials and staples. Moreover, the information on the state of the printer may be information on the size of the recording medium loaded in the printer. Additionally, the information on the state of the printer may be information as to whether or not the optional device is connected to the printer.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a view schematically showing a printing system in a preferred embodiment according to the present invention;

Fig. 2 is a block diagram illustrating the configuration of a printer in the printing system;

Fig. 3 is a view showing a console panel of the printer;

Fig. 4 illustrates one example of acquired information which has been converted into a file format;

Fig. 5 is a flowchart illustrating printer information acquiring process;

Fig. 6 illustrates an example of a setting screen of a printer driver, in which printer information and a result determined in step S26 of Fig. 5 are reflected;

Fig. 7 illustrates another example of the setting screen of the printer driver, in which the printer information and the result determined in step S26 of Fig. 5 are reflected;

Fig. 8 illustrates a further example of the setting

screen of the printer driver, in which the printer information and the result determined in step S26 of Fig. 5 are reflected;

Fig. 9 is a flowchart illustrating the process of determining setting items to be prohibited (step S26 of Fig. 5); and

Fig. 10 is a flowchart illustrating the process of reflecting the printer information on a driver display (step S27 of Fig. 5).

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment according to the present invention will be described below in reference to the attached drawings.

Fig. 1 is a view schematically showing a printing system in a preferred embodiment according to the present invention. The printing system 10 comprises, on a network, a printer 20 and data processing apparatus or personal computers (hereinafter abbreviated as "PCs") 30, each of which serves as a server for transmitting print job data such as image data or text data to the printer 20. On each of the PCs 30 is installed a printer driver (not shown) for controlling the printer 20 so as to recognize the printer 20 to which the job data is to be transmitted. In the above-described printing system 10, various kinds of print conditions such as the number of sheets to be printed, a printing range and the size of the sheet can be set on the printer driver installed on the PC 30.

The job data is converted into data in a format suitable for the printer 20 in accordance with the set conditions, and then, is transmitted to the printer 20.

In the printer 20, the received job data is converted into print data for a raster image, which is then printed on a sheet as a recording material. The printer 20 is provided with a first tray 9A, a second tray 9B, a third tray 9C and a fourth tray 9D which contain sheets different in size or orientation. In this embodiment, a large-volume cassette is placed as the lowermost fourth tray 9D. Although not specially shown, each of the trays 9A to 9D is provided with a sensor disposed along the direction of the thickness of sheets stacked in each of the trays 9A to 9D, and thus, detects the remaining amount of sheets stacked in each of the trays in three stages of "Empty," "Nearly Empty" and "Full." Furthermore, each of the trays 9A to 9D is provided with a restricting plate for positionally restricting the sheets to be set, and consequently, the size of the sheet to be set is detected on the basis of the position of the restricting plate. Here, it is possible to arbitrarily vary the size of the sheets to be set in each of the trays 9A to 9D.

Furthermore, at the upper portion of the main body of the printer 20 is disposed a console panel 2 for setting various kinds of conditions such as printing types or printing postponement. An operator can control the operation of the

printer 20 via the console panel 2.

A double-sided printing unit 11 capable of double-sided printing and a finisher 12 provided with a punch bin 13 for punching a plurality of sheets, to which images have been transferred and fixed, and a staple bin 14 for stapling a plurality of sheets as optional devices which cooperate with the main body of the printer 20 during a printing operation can be connected to the printer 20. In the preferred embodiment shown in Fig. 1, both of the optional devices 11 and 12 are connected to the printer 20.

Fig. 2 is a block diagram illustrating the configuration of the printer 20 in the printing system 10. The printer 20 comprises a CPU 21 for performing the entire sequence control of the printer 20, a data processing unit 22 capable of executing data processing such as color spatial conversion or binary processing, and a printing unit 24 for subjecting the sheet to printing process based on the data processed by the data processing unit 22, with the above-described console panel 2. Moreover, the printer 20 comprises a ROM 25 for storing therein a program for use in printer control by the CPU 21 and a RAM 23 to be used as a work area required for executing the program or a buffer area for the job data. Additionally, the printer 20 comprises, as outside interfaces, an optional interface (I/F) 26 serving as an interface circuit with respect to the above-described optional devices (only the finisher 12

is shown in Fig. 2) and a network interface (I/F) 27 serving as an interface circuit with respect to the PC 30.

When the printer 20 such configured as described above receives the job data from the PC 30 via the network I/F 27, the data is printed under the control of the operations of the component parts in accordance with the printer controlling program stored in the ROM 25 in reference to the various kinds of conditions set on the console panel 2. At this time, the operations of the double-sided printing unit 11 and the finisher 12 connected as the optional devices for the printer 20 are controlled in tune with the printer 20.

Fig. 3 is a view showing the console panel 2 of the printer 20. The console panel 2 is provided with a liquid crystal display 7 for displaying thereon a message such as "READY" as illustrated in Fig. 3 or a screen for setting various kinds of conditions. Furthermore, on the console panel 2 are disposed, as command input keys, a communication state switching key 3 for switching a communicable state with the PC 30 (i.e., ON-LINE) and an incommunicable state (i.e., OFF-LINE), a confidential printing key 4 for executing confidential printing, a forced printing key 5 for instructing forced printing as a finish remains uncompleted in the case where all the finishing process cannot be executed, and a printing postponing key 6 for instructing re-storing of confidential printing in such a manner as to perform printing after

adjustment of conditions on the printer 20 side in the case where all the finishing process cannot be executed. Furthermore, on the console panel 2 is provided a numeric keypad 8 for inputting numerical values such as the number of sheets to be printed or a personal identification number.

As described above, the printer driver for controlling the printer 20 is installed on the PC 30, and thus, it is booted up, for example, at the request of printing from application software. In this booted state, the printer driver provides a setting screen 60 (see Figs. 6, 7 and 8), on which various kinds of conditions relative to printing such as the number of sheets to be printed, the printing range and the size of the sheet can be set. Together with the printer driver, utility software (not illustrated) capable of acquiring various kinds of information on the printer 20 is installed on the PC 30. The utility software is booted up at the time of starting of the PC 30 or in response to a call from the printer driver. In the operated state, it is possible to acquire information on the printer 20 and its optional devices connected to the printer 20 such as the connected state of the optional devices or the presence of consumable items via the communications with the printer 20. The connected state of the optional devices or the presence of consumable items is detected through the optional I/F 26.

The utility software can convert the acquired information

into a file format (e.g., a text format) which can be read by the printer driver, and then, can store it in the PC 30. Fig. 4 illustrates one example of the information which has been converted into the file format.

In the present embodiment, during the booted state of the printer driver, the information on the printer 20 is acquired and stored at predetermined time intervals by the utility software and new information is reflected in the printer driver, so that an operator can accurately grasp the state of the printer 20. In relation to this, Fig. 5 is a flowchart illustrating printer information acquiring process. When the printer driver is booted up at the request of printing, it is first checked in S21 as to whether or not the utility software is operated. If the result is affirmative, the routine jumps to S25; otherwise, if the result is negative, the routine proceeds to S22. In S22, the utility software is booted up. Next, in S23, various kinds of information on the printer 20 and the optional devices connected to the printer 20 are acquired by means of the utility software. Furthermore, in S24, the acquired information is filed in a text format. In S25, the text file stored in the PC 30 by the utility software is read.

Subsequently, in S26, setting items to be prohibited on the setting screen of the printer driver are determined based on the acquired information on the printer. Examples of the

setting items to be prohibited include "double-sided printing" in the state in which the double-sided printing unit 11 (see Fig. 1) is not connected to the printer 20, or "Staple" or "Punch" in the state in which the finisher 12 is not disposed. The process of determining the setting items to be prohibited will be described later in reference to Fig. 9. In S27, the acquired information on the printer and the determination result in S26 are reflected in the printer driver. In this case, the items determined in S26 as the setting items to be prohibited are grayed out (or shaded) in such a manner as to be disabled from being selected. Otherwise, in order to disable the setting items to be prohibited from being selected, such items may be deleted from a menu of choices.

The printer information acquiring process is executed based on an operating program installed on the PC 30. In the present embodiment, the program is stored in a storage device such as a hard disk drive (not shown) in the PC 30. Such a program can be installed on the storage device using a computer-readable floppy disk 30a (see Fig. 2) and a CD-ROM.

Figs. 6 and 7 illustrate examples of the setting screen of the printer driver, in which the printer information and the result determined in step S26 of Fig. 5 are reflected. The setting screen 60 is constituted of an appearance display section 61 for displaying the final appearance at the time of outputting, a printer body information display section 62 for

displaying the state of a printer body, a condition setting section 63 for setting various kinds of conditions, and an executing section 64 provided with various kinds of execution keys. On the printer body information display section 62 are schematically displayed the printer body and the optional devices connected to the printer body. In Fig. 6, there are displayed a double-sided printing unit 62b and a finisher 62c together with a printer body 62a. This display reveals that the double-sided printing unit 11 and the finisher 12 are connected to the printer 20. Moreover, on the printer body information display section 62 is displayed information on "Toner," "Jamming," "Staple" or "Error." That is, with respect to "Toner," there is displayed information as to whether or not developing toner remains enough to achieve the printing operation; with respect to "Jamming," there is displayed information as to whether or not paper jamming occurs in the printer 20; with respect to "Staple," there is displayed information as to whether or not staples remain in the finisher 12; and with respect to "Error," there is displayed information as to whether or not an error occurs in the printer 20 or its optional devices. Fig. 6 shows the display indicating that a sufficient quantity of toner remains, no paper jamming occurs, staples remain in the finisher 12 and no error occurs.

Additionally, on the printer body information display section 62 is displayed a table 62d showing the remaining

number of sheets different in size or orientation, stacked in the first to fourth trays 9A to 9D in the printer 20. In Fig. 6, the table 62d shows that "Tray 3" corresponding to the third tray 9C is "Empty," and therefore, it is found that the sheets stacked in the third tray 9C in the printer 20 are used up. Fig. 7 illustrates the state in which the result determined in S26 of Fig. 5 is reflected based on the sheet-out information. In Fig. 7, a box of the item "Sheet Selection" is opened in the condition setter 63. In this box, symbols "A4T," "A4Y," "A3T" and "A4" indicating the sizes and orientations of the sheets respectively corresponding to the first to fourth trays 9A to 9D in the printer 20 are arranged in order from top. Among these symbols, the symbol "A3T" is determined to be a setting item to be prohibited based on the sheet-out information on the third tray 9C, so that the symbol "A3T" is grayed out, i.e., cannot be selected. Consequently, the operator cannot select, on the printer driver, the symbol "A3T" indicating the sheet-out condition on the printer 20. Therefore, it is possible to avoid any change in finish or any discard of job data because the printer 20 and its optional devices cannot cope with the job data transmitted from the PC 30.

In the meantime, the final appearance of a printout is schematically displayed on the appearance display section 61 based on the set conditions in the condition setter section 63. As shown in Fig. 6, in the case where "Long Edge" and "Upper

Left Corner" are respectively set in the items "Punch" and "Staple" in the condition setting section 63, punch holes 61b together with a sheet 61a are displayed over one long edge of the sheet 61a on the appearance display section 61, and further, a staple 61c is displayed at the upper left corner of the sheet 61a.

Moreover, Fig. 8 illustrates a further example of the setting screen of the printer driver, in which the printer information and the result determined in step S26 of Fig. 5 are reflected. In this example, no optional device connected to the printer body 62a is displayed on the printer body information display section 62. Therefore, this display shows that neither the double-sided printing unit 11 nor the finisher 12 are connected to the printer 20. In this case, since no finisher 12 is connected, no information on "Staple" is displayed on the printer body information display section 62. The result determined in step S26 of Fig. 5 based on the above-described information on the optional devices is reflected in the condition setting section 63. Namely, the items "Printing Side," "Punch" and "Staple" are determined to be setting items to be prohibited based on the information that neither the double-sided printing unit 11 nor the finisher 12 are connected to the printer 20, so that these items are grayed out, and therefore, cannot be selected. In the example illustrated in Fig. 8, the item "Printing Side", "Punch" and "Staple" are

grayed out as they are set in "Single-side", "No" and "No", respectively. Therefore, the operator cannot change such setting conditions. As a result, it is possible to avoid any change in finish or any discard of the job data because the printer 20 cannot cope with the job data transmitted from the PC 30.

As described above, according to the present invention, the information on the printer 20 and its optional devices connected to the printer 20 is acquired at predetermined time intervals, and then, the setting conditions in the printer driver are automatically updated based on the information, so that the operator can accurately grasp the states of the printer 20 and its optional devices. Furthermore, the operator can previously check as to whether or not a desired finish can be obtained. In the case where it is found that no desired finish can be obtained, it is possible to avoid any change in finish or any discard of the job data by, for example, varying the size of sheets stacked in each of the trays 9A to 9D or supplementing the sheets or the toner in advance. As a result, the job data which can be coped with by the printer 20 and its optional devices can be transmitted all the time, thereby efficiently achieving the printing operation.

Fig. 9 is a flowchart illustrating the process of determining the setting items to be prohibited (step S26 of Fig. 5). In the process of determining the setting items to be

prohibited, it is first determined in S31 as to whether or not there are sheets in the first tray 9A in the printer 20. If the result is affirmative, the routine proceeds directly to S33; in contrast, if the result is negative, the sheet size of the first tray 9A in the item "Sheet Selection" is designated as the setting item to be prohibited in S32, and then, the routine proceeds to S33. In S33, it is determined as to whether or not there are sheets in the second tray 9B in the printer 20. If the result is affirmative, the routine proceeds directly to S35; in contrast, if the result is negative, the sheet size of the second tray 9B in the item "Sheet Selection" is designated as the setting item to be prohibited in S34, and then, the routine proceeds to S35. Subsequently, in S35, it is determined as to whether or not there are sheets in the third tray 9C in the printer 20. If the result is affirmative, the routine proceeds directly to S37; in contrast, if the result is negative, the sheet size of the third tray 9C in the item "Sheet Selection" is designated as the setting item to be prohibited in S36, and then, the routine proceeds to S37. Furthermore, in S37, it is determined as to whether or not there are sheets in the fourth tray 9D in the printer 20. If the result is affirmative, the routine proceeds directly to S39; in contrast, if the result is negative, the sheet size of the fourth tray 9D in the item "Sheet Selection" is designated as the setting item to be prohibited in S38, and then, the

routine proceeds to S39.

In S39, it is determined as to whether or not the double-sided printing unit 11 is disposed in the printer body. If the result is affirmative, the routine proceeds directly to S41; in contrast, if the result is negative, the item "Printing Side" is designated as the setting item to be prohibited in S40, and then, the routine proceeds to S41. In this case, the item "Printing Side" is automatically set to "Single Side." Subsequently, it is determined in S41 as to whether or not the finisher 12 is connected to the printer body. If the result is affirmative, the routine proceeds directly to S43; in contrast, if the result is negative, the items "Punch" and "Staple" are designated as the setting items to be prohibited in S42, and then, the routine proceeds to S43. In S43, it is determined as to whether or not there are staples. If the result is affirmative, the routine is returned to the main routine illustrated in Fig. 5; in contrast, if the result is negative, the item "Staple" is designated as the setting item to be prohibited in S44, and then, the routine is returned to the main routine illustrated in Fig. 5.

Moreover, Fig. 10 is a flowchart illustrating the process of reflecting the printer information in the driver display (step S27 of Fig. 5). In this reflecting process, first in S51, the items designated as the setting items to be prohibited are grayed out, and therefore, cannot be selected. Next, in S52,

the items not designated as the setting items to be prohibited are normally displayed, and therefore, can be selected. Upon completion of this process, the routine is returned to the main routine illustrated in Fig. 5.

Finally, it is obvious that the present invention is not limited to the embodiments described above, and various kinds of modifications and changes in designing may be possible without departing from the scope of the present invention. For example, in the above-described embodiment, although the utility software for acquiring the information on the printer 20 and its optional devices to be connected to the printer 20 is installed on the PC 30, the printer driver per se may acquire the information on the printer 20 and its optional devices.